Claims

1. An isolated or substantially pure form of a nucleic acid molecule encoding a mammalian GDNF family receptor α-4 (GFRα-4).

2. The nucleic acid molecule of claim 1 which is derived from a rat, mouse or human.

3. The nucleic acid molecule of claim 1 or 2 encoding a mammalian GDNF family receptor α-4 (GFRα-4) having the amino acid sequence illustrated in Sequence ID No. 8 or 9 or encoding a functional equivalent or bioprecursor of said receptor.

4. A nucleic acid molecule according to any of claims 1 to 3 which is a DNA molecule.

5. A nucleic acid molecule according to claim 4, wherein said DNA molecule is a cDNA molecule.

6. A nucleic acid molecule according to any preceding claim having the sequence illustrated in any of SEQ ID Nos 5, 6, or 7 or the complementary sequence thereof.

7. A nucleic acid molecule capable of hybridising to the molecule of any of claims 1 to 6 or the complementary sequences thereof under conditions of high stringency.

8. A GFRα-4 receptor encoded by a nucleic acid molecule according to any of claims 1 to 6.

9. A DNA expression vector comprising a nucleic acid molecule according to any of claims 4 to 6.

10. A host cell transformed or transfected with the vector according to claim 9.

11. A host cell according to claim 10, which cell is a eukaryotic cell.

12. A host cell according to claim 10 or 11 wherein said cell is a mammalian cell.

13. A host cell according to claim 12 which cell is a human embryonic kidney cell HEK293 or a Cos-7 cell.

14. A transgenic cell, tissue or organism comprising a transgene capable of expressing a GFRα-4 receptor protein having the amino acid sequence illustrated in Sequence ID No's. 8 or 9 or the amino acid sequence of a functional equivalent or bioprecursor thereof.

15. A transgenic cell tissue or organism according to claim 14, wherein said transgene comprises a nucleic acid molecule according to any of claims 1 to 6.

16. A GFRα-4 receptor protein or a functional equivalent derivative or bioprecursor thereof, expressed by the cell according to any of claims 10 to 15.

17. A HEK293 or Cos-7 cell line trasfected or transformed with the expression vector of claim 9.

18. An antisense molecule comprising a nucleic acid which is capable of hybridising to the nucleic acid according to any of claims 1 to 6.

19. A molecule according to claim 18 for use as a medicament.

20. Use of a molecule according to claim 18 in the manufacture of a medicament for treating pain or carcinoma.

21. An isolated receptor having the amino acid sequence as illustrated in any of SEQUENCE ID No 8 or 9 or the amino acid sequence of a functional equivalent or bioprecursor of said receptor.

22. A pharmaceutical composition comprising a nucleic acid molecule according to any of claims 1 to 6 together with a pharmaceutically acceptable carrier, diluent or excipient therefor.

23. A pharmaceutical composition comprising a molecule according to claim 18 or a receptor according to claim 21 together with a pharmaceutically acceptable carrier, diluent or excipient therefor.

24. A compound which acts as an agonist or an antagonist in relation to the receptor of claim 21.

25. A pharmaceutical composition comprising an

agonist or an antagonist according to claim 24 together with a pharmaceutically acceptable carrier, diluent, or excipient therefor.

26. A method of determining whether a compound is an agonist or an antagonist in relation to a receptor GFRα-4 according to any of claims 8 or 21, which method comprises contacting a cell expressing said receptor with said compound to be tested and monitoring the level of any GFRα4 mediated functional or biological response.

27. A method according to claim 26 wherein said cell is a cell according to any of claims 10 to 15.

28. A method according to claim 26 or 27 wherein the GFRα-4 mediated functional or biological response comprises the level of phosphorylation in said cell.

29. A method of determining whether a compound is an agonist, antagonist or a ligand in relation to GFRα-4 receptor, according to claims 8 or 11, which method comprises contacting a membrane preparation of cells expressing said GFRα-4 with said compound in the presence of cRET or similar protein which interacts with GFRα-4 in the signal transduction pathway of which GFRα4 is a component and monitoring the level of any interaction of GFRα-4 with cRET or said similar protein.

30. A method of producing an antagonist or agonist of GFRα-4 comprising the steps of a method of any one of claims 26 to 29; and additionally

(i) synthesizing the compound obtained or identified in said method or a physiologically acceptable analog or derivative thereof in an amount sufficient to provide said antagonist or agonist in a therapeutically effective amount to a patient; and/or

(ii) combining the compound obtained or identified in said method or an analog or derivative thereof with a pharmaceutically acceptable carrier.

31. A compound identifiable as an agonist by the method according to any of claims 26 to 29 for use as a medicament.

32. Use of a compound identifiable as an agonist by the method according to any of claims 26 to 29 in the preparation of a medicament for the treatment of neurodegenerative diseases, Alzheimers disease, Parkinsons disease, Motor Neuron Disease, peripheral neuropathy, spinal cord injury, familial hirschsprung disease, carcinomas and diseases associated with GFRα4 receptor dysfunction.

33. A compound identifiable as an antagonist by the method according to any of claims 26 to 29 for use as a medicament.

34. Use of a compound identifiable as an antagonist by the method according to any of claims 26 to 29 in the preparation of a medicament for the treatment of carcinomas or in alleviating pain.

35. A pharmaceutical composition comprising a compound according to claim 31 or 32 together with a pharmaceutically acceptable carrier, diluent or excipient therefor.

36. An antibody specific for GFRα-4 receptor protein having an amino acid sequence as illustrated in Sequence ID No's. 8 or 9 or an amino acid sequence of a functional equivalent or bioprecursor of said receptor.

37. A pharmaceutical composition comprising an antibody according to claim 36 together with a pharmaceutically acceptable carrier, diluent or excipient therefor.

38. A method of identifying ligands for GFRα-4 receptor protein, which method comprises contacting a receptor according to claim 8 or 11 with a cell extract or a compound to be tested and isolating any molecules bound to said receptor.

39. A method of determining whether a compound is a ligand for GFRα-4 receptor, which method comprises contacting a cell expressing said receptor according to any of claims 10 to 15 with said compound and monitoring the level of any GFRα-4 mediated functional or biological response.

40. A method according to claim 39 which comprises monitoring the level of phosphorylation in said cell.

41. A compound identifiable as a ligand for GFRα-4 according to the method of claims 39 or 40 for use as a medicament.

42. Use of a compound identifiable according to the method of claims 39 or 40 in the preparation of a medicament for the treatment of neurodegenerative diseases, Alzheimers disease, Parkinsons disease, Motor Neuron Disease, peripheral neuropathy, spinal cord injury, familial hirschsprung disease in addition to carcinoma and diseases associated with GFRα-4 dysfunction.

43. A kit for determining whether a compound is an agonist or an antagonist of GFRα-4 receptor protein which kit comprises a cell according to any of claims 10 to 15, means for contacting said cell with said compound and means for monitoring the level of GFRα-4 mediated functional or biological response in said cell.

44. A kit according to claim 43, wherein said

GFRα-4 mediated functional or biological response comprises the level of phosphorylation in said cell.

45. A diagnostic kit including a probe which comprises any of, a nucleic acid molecule according to any of claims 1 to 6 or a fragment thereof or an antisense molecule according to claim 18 and means for contacting biological material to be tested with said probe.

46. A kit for determining whether a compound is a ligand of GFRα-4 receptor protein, which kit comprises a membrane preparation from cells expressing GFRα-4, means for contacting said preparation with said compound in the presence of cRET or a similar protein involved in the signal transduction pathway of which GFRα-4 is a component and means for measuring any interaction between GFRα-4 and cRET or said similar protein.